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Reply to Office Action of January 7, 2004

AMENDMENTS TO THE CLAIMS

1. (Original) A helical antenna manufacturing apparatus, comprising:
a core made of insulative material;
a first roller printing a conductive and viscous paste on a surface of the core to form a helical line;
a roller driver rotating the first roller;
a core driver rotating the core and moving the same in a longitudinal direction; and
a controller controlling the roller driver and the core driver to control an rpm of the core, a longitudinal moving speed of the core, and the rpm of the roller, the longitudinal moving speed being set according to working frequency bands of the antenna.
2. (Original) The apparatus of claim 1, wherein the apparatus further comprises:
a paste box containing the paste; and
a paste provider comprising a paste injector injecting the paste into the paste box.
3. (Original) The apparatus of claim 2, wherein the apparatus further comprises one or more second rollers contacted to the paste in the paste box and rotated, and providing the paste to the first roller.
4. (Original) The apparatus of claim 1, wherein an outer circumference of the first roller is sloped at a predetermined angle.

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5. (Original) The apparatus of claim 1, wherein a diameter of a central part of the first roller is greater than a diameter of an outer part of the first roller.

6. (Original) The apparatus of claim 1, wherein the apparatus further comprises:
a core provider providing the core to a position to be contacted with the first roller; and
a drier drying the core on which the helical line is formed.

7. (Original) A helical antenna manufacturing apparatus, comprising:
a core made of insulative material;
a dispenser comprising a conductive and viscous paste, and printing the paste on a surface of the core to form a helical line;
a core driver rotating the core and moving the same in a longitudinal direction; and
a controller controlling the core driver to control the rpm of the core and a longitudinal moving speed of the core, the longitudinal moving speed being set according to working frequency bands of the antenna.

Claims 8-12 (Canceled)

13. (Original) A helical antenna manufacturing apparatus, comprising:
a core made of insulative material;
a roller printing a conductive and viscous paste on a surface of the core to form a helical line unit comprising a first helical line of a first frequency band and a second helical line of a second frequency band;

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a roller driver rotating the roller;

a core driver rotating the core and moving the same in a longitudinal direction of the core; and

a controller controlling the roller driver and the core driver to control an rpm of the core and an rpm of the roller, and sequentially controlling the core driver according to a first moving speed which is set according to the first frequency band at which the antenna is operated and according to a second moving speed which is set according to the second frequency band.

14. (Original) The apparatus of claim 13, wherein the controller controls the core driver during a first set time according to the first moving speed, and then during a second set time according to the second moving speed, and the first and the second set times are changed according to working frequency bands of the antenna.

15. (Original) A helical antenna manufacturing apparatus, comprising:

a core made of insulative material;

a dispenser comprising a conductive and viscous paste, and printing the paste on a surface of the core to form a helical line unit including a first helical line of a first frequency band and a second helical line of a second frequency band;

a core driver rotating the core and moving the same in a longitudinal direction; and

a controller controlling the core driver to control the rpm of the core and sequentially controlling the core driver according to a first moving speed which is set according to the first frequency band at which the antenna is operated and according to a second moving speed which is set according to the second frequency band.

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Claims 16 and 17 (Canceled)

18. (Original) A helical antenna manufacturing method, comprising the steps of:
printing a helical line unit, including a first helical line of a first frequency band and a second helical line of a second frequency band, on a surface of a core which is insulation;
dipping a part of the core in a conductive paste to form a terminal;
connecting a feeder to the terminal of the core, the feeder being electrically connected to an external circuit; and
sealing an outer part of the core with a cover of insulation.

19. (Original) In an antenna which is installed on a circuit board within a communication device, a helical antenna, comprising:
a core made of insulative material;
a conductive line formed over an entire surface of the core in a helical configuration; and
a feeder connected to the conductive line, formed on a lower part of the core, and electrically connected to the circuit board and the conductive line and the feeder being made of conductive paste.

20. (Original) The antenna of claim 19, wherein the core is made of insulative material and includes a cavity formed within the core, and an insulation unit having a convex portion is formed on the circuit board of the communication device, the size of the convex portion corresponding to an inner diameter of the core and the core being inserted on the convex portion of the insulation unit to be installed on the circuit board.

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21. (Original) The antenna of claim 19, wherein an insulation unit having a land is formed on the circuit board of the communication device, and the size of the land corresponds to an inner diameter of the core, the core being installed perpendicularly to the land of the insulation unit.

22. (Previously Presented) The antenna of claim 19, further comprising a second helical antenna installed on the circuit board within the communication device.

23. (Original) In a method for manufacturing an antenna which is installed on a circuit board within a communication device, a helical antenna manufacturing method, comprising the steps of:

- (a) printing a conductive line on a surface of a core as a helical pattern;
- (b) dipping a part of the core in a conductive paste to form a feeder; and
- (c) installing the core on an internal circuit board of the communication device.

24. (Original) The method of claim 23, wherein the method further comprises a step of forming an installation unit, which has a convex portion having a size corresponding to an inner diameter of the core, on the circuit board of the communication device in the case a cavity is formed in the inner part of the core, and in the step (c), the core is inserted on the convex of the installation unit to be installed on the circuit board.

25. (Original) The method of claim 23, wherein the feeder of the core is installed on the circuit board by a soldering process.

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26. (Original) The method of claim 23, wherein the feeder of the core is installed on the circuit board by using conductive glue.

27. (Original) The method of claim 23, wherein in the step (c), after a metallic fixture is installed on the circuit board by soldering or using conductive glue, the core is electrically contacted to the metallic fixture.